Firestopping Education Program

Firestop Contractors International Association

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Firestop Systems

Outline – Firestop Education

- Fire Dynamics ~ Fire Safety Principles
  - Fire Dynamics
  - Compartmentation Concepts
  - Firestop Systems –
    - Definitions, Design Testing / Qualification
  - Codes / Specifications / “Installation & Inspection Protocol, Maintenance
  - Tested Firestop Systems
    - Materials
    - Systems Designs
      - Penetrating items, joints, perimeter characteristics
  - Tools
  - Safety
  - Summary/Questions /Answers
Firestop Systems

♦ 1st Interstate Bank

“Fast Spread of Fire due to lack of or improperly installed firestopping at building perimeter”

“Breaches also occurred from the fire floor to an upper floor copy room, through penetrations. There was not enough oxygen for fire.”

= Fire and Smoke Spread

3M, OPL Photos
Firestop Systems

- Fire Dynamics in Buildings
  - Ignition Source
  - Combustible object, Fuel
  - Oxygen
  - More Fuel...more oxygen

= Fire and Smoke Spread
Firestop Systems

♦ Total Fire Protection Concept

Point 1: Human Factors
   Education and Training
   Egress and Evacuation

Point 2: Alarms and Detection
   Fire Alarms
   Smoke Detectors

Point 3: Effective Compartmentation
   F/S Resistance Rated Construction
   Fire Rated Doors & Windows
   Fire & Smoke Dampers
   Fire Glass
   Firestopping

Point 4: Suppression
   Sprinkler Systems
   Fire Department

3M, OPL Photos
Firestop Systems

- Fire and Smoke Spread Prevention
  - Compartmentation Objective –
    Limit Fire Spread
    - Object of origin
    - Room of origin
Firestop Systems

- Fire and Smoke Protection in Buildings
  - Room of origin
  - Area of origin
- Defend in Place
  - Horizontal Evacuations
- Protect Structure
  - *ASTM E 119 is not performed with open holes in assembly!*
Firestop Systems

- Effective Compartmentation Components
  - Fire Resistance Rated Walls / Floors
  - Fire Doors – Rolling & Swinging, Hardware
  - Fire Damper Systems Assemblies
  - Fire Rated Glazing Systems Assemblies
  - Firestop Systems
Firestop Systems

Total Fire Protection

POINT 1

HUMAN FACTORS

♦ Education and Training
♦ Egress and Evacuation
  ♦ Building Layout
♦ Response Time
♦ Maintenance
♦ Building Policies
Firestop Systems

Total Fire Protection

POINT 2

DETECTION & ALARMS

♦ Fire & Smoke Detection
♦ Occupant Discovery and Reaction
♦ Fire Alarm Systems
Firestop Systems

Total Fire Protection

POINT 3

EFFECTIVE FIRE RESISTANCE RATED & SMOKE RESISTANT COMPARTMENTATION

♦ Fire Walls
♦ Fire & Smoke Barriers
♦ Fire & Smoke Partitions
Firestop Systems

Total Fire Protection

POINT 4

ACTIVE SYSTEMS

FIRE ESUPRESSION

Sprinklers

Fire Department Water Hoses
Firestop Systems

♦ Active Fire Protection Systems - Suppression
  – “Suppress”
    • Sprinkler Systems
    • Alarm and Detection Systems
  – “Firefighters / Human Factors
    • Educate
    • Extinguish
Firestop Systems

Active Fire Protection Systems - Suppression

- Sprinkler Systems - 3 parts
  - Actuator / Responder – Temperature driven, individual activated
  - Water Flow – Sufficient pressure
    - Not all areas at once
  - Positioning
    - Contain and suppress
  - Extinguish??
Firestop Systems

- Active Fire Protection Systems - Suppression
  - Sprinkler - Types
    - Standard
    - Early Response
Firestop Systems

- Active Fire Protection Systems - Suppression
  - Advantages -
    - *Suppress* / Control Fires
    - Reliability when activated
    - *May* extinguish.
    - May Reduce Loss of Life
    - Property Loss Prevention
Firestop Systems

- Active Fire Protection – Disadvantages
  - Heat for Activation
  - Defective Sprinkler Heads - Recalls
  - Pumping System Malfunction
  - Human Error –
    - Water supply, Pressure, Maintenance??
  - Occupancy / Building Use Change
  - Designed Fire Load vs. Actual
  - Water Damage
  - Smoke Creation

- Properly designed, installed and maintained suppression systems are effective….
Firestop Systems

♦ Active Protection Systems
  – “In October, 2001, Consumer Product Safety Commission filed an administrative complaint against SCM, alleging that SCM’s Star ME-1 fire sprinklers are defective and are likely to fail to activate as intended in a fire, thereby exposing consumers to the risk of death or serious injury.”
**Firestop Systems**

- What is Effective Compartmentation?
  - “Continuity - Continuous Barriers”
  - Fire Resistance Rated Walls / Floors
  - Floor / Ceiling Assemblies
Firestop Systems

- Effective Compartmentation = Continuity
  - Fire Walls and Floors
  - Fire Doors (Rolling, Swinging)
  - Fire, Smoke, Fire/Smoke Dampers
  - Fire Rated Glazing
  - Firestop Systems
Firestop Systems

- Fire Walls and Floors:
  Continuous Barriers, Fire Rated Assemblies Based on...
  - Concrete
  - Concrete Block
  - Plaster
  - Gypsum Block
  - Drywall
  - Floor/Ceiling Assemblies
  - Firestop Systems

“Wall/Floor-Tested Systems”
Firestop Systems

♦ Effective Compartmentation
  • Fire Walls and Floors
  • *Fire, Smoke, Fire/Smoke Dampers*
  • Fire Rated Rolling & Swinging Doors
  • Fire Rated Glazing
  • Firestop Systems
Firestop Systems

- Fire and Smoke Protection in Buildings
  - Effective Compartmentation
    - Fire Walls and Floors
    - Fire Dampers
    - *Fire Rated Doors – Rolling & Swinging*
    - Fire Rated Glazing
  - Firestop Systems
Firestop Systems

- Fire and Smoke Protection in Buildings
  - Effective Compartmentation
  - Fire Walls and Floors
  - Fire Dampers
  - Fire Doors
  - **Fire Rated Glazing**
  - Firestop Systems
Firestop Systems

- Fire and Smoke Protection in Buildings
  - Effective Compartmentation
    - Fire Walls and Floors
    - Fire Dampers
    - Fire Doors
    - Fire Rated Glazing
    - Firestop Systems
Firestop Systems

- Fire Resistance Rated Systems – Terms
- Fire Resistance – Time, in minutes or hours that materials or assemblies have withstood a fire exposure as determined by tests, methods based on tests, or this code …. NFPA

  - Fire Barrier – Hourly Rated – IBC
  - Fire Barriers (Walls) –
    Wall other than fire rated, that have a fire resistance rating;
    • 2 hour Rated – NFPA
    • 1 hour Rated - IBC
  - Fire Wall – Fire resistance rating, withstand structural collapse

- ASTM E 119, UL 263
Firestop Systems

◆ “Resistance Rated Systems” – Terminology
  – Smoke and Fire Resistance Rated Assembly
    • Smoke Barrier –
      – IBC
      – NFPA
    • Smoke Partition
      – IBC –
      – NFPA – Continuous membrane that is designed to form a barrier to limit the transfer of smoke.
Firestop Systems

♦ Fire Resistance Rated Construction – Effective Compartmentation

– Continuous Walls / Floors
  • Interior and Exterior Fire Resistance Rated Walls
    – Exterior – Distance Regulations
    – Interior – Compartment Buildings
  • Firestop Systems
    – Penetrations
    – Joints – Walltops – Building Perimeter Joints
  • Fire & Smoke Damper Duct Systems
  • Fire Rated Doors and Hardware Systems
  • Fire Rated Glazing
Firestop Systems

♦ “Fire Resistance Rated Assembly Identification”
  – Fire Rated Wall Systems ID and Prep in Existing Buildings

  • Identified on Architectural Plans
  – 1, 2, 3, 4 hour rated assemblies
  • HINTS if no PLANS:
  – Multiple Layer Drywall
  – Concrete / Concrete Block Wall
  – Wall extends above drop ceiling to floor above
  – Fire Dampers
  – Fire Doors / Labels
  – Wall Labels – “2 hour rated assembly”
  – Exterior Walls MAY be rated
  – Wall extends past exterior perimeter wall
Firestop Systems
Firestop Systems

Table 1: Thermal Movement Values for Steel Frames (Ref. 9.10)

<table>
<thead>
<tr>
<th>Length of bay perpendicular to fire wall (ft (m))</th>
<th>Minimum clearance &quot;x&quot; for steel frame expansion, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 (6.10)</td>
<td>2 1/2 (64)</td>
</tr>
<tr>
<td>25 (7.62)</td>
<td>3 1/4 (83)</td>
</tr>
<tr>
<td>30 (9.14)</td>
<td>3 1/8 (95)</td>
</tr>
<tr>
<td>40 (12.19)</td>
<td>4 3/8 (114)</td>
</tr>
<tr>
<td>45 (13.72)</td>
<td>5 (127)</td>
</tr>
<tr>
<td>50 (15.24)</td>
<td>5 3/4 (146)</td>
</tr>
<tr>
<td>55 (16.76)</td>
<td>6 1/4 (159)</td>
</tr>
<tr>
<td>60 (18.29)</td>
<td>7 (178)</td>
</tr>
</tbody>
</table>

Concrete masonry fire wall
Firestop Systems

- Fire Resistance Rated Assembly Identification
  - Fire Rated Floor Systems Identification and Prep in Existing Buildings
    - Identified on Architectural Plans
      - 1, 2, 3, 4 hour rated assemblies
    - HINTS:
      - Codes require most multi story floors be fire rated
      - Concrete, pre-cast concrete floor system
      - Metal Pan, formed concrete floor
      - Fire Dampers
      - Firestop Systems in Floor
Firestop Systems
Firestop Systems
Firestop Systems

- Wall Assemblies
Firestop Systems

- “Fire Resistance Rated Patching Systems”
  Gypsum Drywall Assembly
Firestop Systems

• “Rated Patching Systems” – Drywall
  – True / False?
  • Framing between studs, new wallboard?
  • New wallboard, tape and compound to hold??
  • One layer drywall patches 1 layer system, 2 layer?
  • Studless Patching Clip Systems??
Firestop Systems

♦ “Rated Patching Systems” – Concrete
  – True / False?
    • Drywall over the hole?
    • Install New Concrete?
    • Cover with Blank Hole Firestop System?
    • Mortar – Full Thickness of the wall
    • Mortar – Skim Coat?
    • Fresh Concrete Patch?
  – Only if Tested and Listed System, or equivalency from code approved by AHJ, Design Professional, Building Owners.
Firestopping & Compartmentation for Safety

- FCIA Members, Effective Compartmentation & Firestop Quality Process...
  - Firestop Systems Tested to ASTM E 814, UL 1479/2079, CAN S-115, ASTM E 2307
  - Specified by Professionals
  - Installed by FCIA Member, FM 4991, UL Qualified
  - Inspected to ASTM E2174 & ASTM E2393 Inspection Process by Qualified Firms/Individuals
  - Maintained by FCIA Member Firestopping Contractors, Special Inspection Agencies, others
Firestopping & Compartmentation for Safety

- **Sealants**
  - Silicone, Latex, Intumescent
- **Wrap Strips**
  - “Thick, Thin, Wide, Less Wide”
- **Putties**
- **Pillows**
- **Composite Sheets**
- **Bricks / Plugs**
- **Pre Fabricated Kits**
- **Mortar**
- **Spray Products**

Graphics, STI,3M, AD, HILTI, Nelson
Firestopping & Compartmentation for Safety

♦ Firestop Systems Materials

♦ Pipes – Cables
  – Sealants, Wrap strips, Putties, Prefabricated Kits

♦ Gaps/Joints/Walltops/Perimeter Joints
  – Sealants – Sprays – Track Systems

♦ “Backing Material”
  – Mineral Wool, Ceramic Fiber,
  – Backer Rod, Others

Graphics - AD, Nelson, Tremco
Firestop Systems

♦ “Fire Resistance Rated Assemblies”

C-AJ-1058
F Rating — 3 H
T Rating — 0 Hr
L Rating at Ambient — Less Than 1 CFM/sq ft
L Rating at 400 F — Less Than 1 CFM/sq ft

Key Points to Know:
♦ No Sleeve
♦ Annular Space 0 – 3-1/4”
♦ Metal Pipe only
♦ Floor/wall type
Firestopping & Compartmentation for Safety

- Firestop Products Become Firestop Systems -
  - “A Specific field erected construction, consisting of an assemblage of materials to prevent the spread of fire through openings in fire rated walls and floors using ASTM E 814 / UL 1479, S-115, UL 2079, E 2307 as the test method…”
  - S-115 – Incorporated all of UL 2079 in 2004
  - Testing = Suitability statement for use of a firestop product in a specific system application
Firestopping & Compartmentation for Safety

♦ What are Firestop Systems?
  – ASTM E814/UL 1479–UL S115 Tested Systems
    • F Rating - Flame
    • T Rating – Temperature
    • H Rating – Hose (CAN-Optional)
    • L Rating – Smoke (UL)
    • W Rating – Water (ULus)

Graphics – 3M
Firestopping & Compartmentation for Safety
Hose Stream & “W” Rating
Firestopping & Compartmentation for Safety

♦ Firestop Systems Directories – ULc, ULus®,

*Systems Selection…Not as easy as it looks…*
Firestop & Compartmentation for Safety
UL Systems

System Example:
CAJ 1155
Metal Pipe in Concrete Floor or Wall

1. FLOOR OR WALL ASSEMBLY:
   A. MINIMUM 4-1/2" THICK LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOOR.
   B. U.L. CLASSIFIED CONCRETE BLOCK WALL (MINIMUM 8" BLOCK).
2. PENETRATING ITEM TO BE ONE OF THE FOLLOWING:
   A. MAXIMUM 20" DIAMETER STEEL PIPE.
   B. MAXIMUM 6" DIAMETER COPPER PIPE.
   C. MAXIMUM 6" DIAMETER STEEL CONDUIT.
   D. MAXIMUM 4" DIAMETER EMT.
3. OPTIONAL: MAXIMUM 22" DIAMETER STEEL PIPE SLEEVE (SCHEDULE 10 OR HEAVIER).
4. MINIMUM 4" THICKNESS MINERAL WOOL (MIN. 4 PCF DENSITY) RECESSED 1/2" FROM TOP OF SLEEVE.
5. MINIMUM 1/2" DEPTH HILTI FS-ONE FIRESTOP SEALANT.
6. A GENEROUS BEAD OF HILTI FS-ONE FIRESTOP SEALANT AROUND OUTER PERIMETER OF STEEL SLEEVE.

NOTES:
1. MAXIMUM DIAMETER OF OPENING = 22".
2. ANNUAL SPACE = MINIMUM 0", MAXIMUM 1-1/2".

Graphics - HILTI
Firestop Systems

- Why have Fire Resistance Rated Assemblies?
  - Fire and Life Safety Protection
  - Effective Compartmentation
    - Fire Spread Prevention
    - Smoke Travel
      - 70% of all deaths not in “room of origin”
        (HILTI website statistic)
Firestop Systems

- Why have Fire Resistance Rated Assemblies?

*Any penetration or gap in a fire barrier... thruway for flames, smoke, and gases.*
Firestop Systems

- Why have Fire Resistance Rated Assemblies?

  Whenever a fire barrier is violated, code (law) requires that it be restored to its original rating.

  When various trades break through fire barriers to run cables and pipes, they must be held accountable
Firestop Systems
Firestop Systems

- Effective Compartmentation Concept
  - Limit Fire Spread
  - Reduce Fire, Property and Life Safety Risk
  - Extinguishing Aid
  - “Defend-in-place” - Hospitals, Hotels, Jails
  - Egress / Entrance Path / Area of Safety
    - “Occupants out”
    - “Firefighters in”
Firestop Systems

♦ US Building Codes
  – International Building Code – ICC
    • BOCA – Building Officials and Code Admin., Intl.
    • SBCCI – Southern Building Code Congress, Intl.
    • UBC – ICBO – Intl. Conference of Building Officials

♦ Converged to one code
US ICC Adoptions – ICCsafe.org
March ‘08
Firestop Systems

♦ US Building Codes
  – Codes Not Published after 1999….
    • BOCA – Building Officials and Code Administrators International, Inc.
    • UBC – Uniform Building Code
    • SBCCI – Southern Building Code Congress International
Firestop Systems

- Compartmentation and US Building Codes - “Firestopping Points”
  - BOCA, UBC, SBCCI
    - BOCA 96 – UBC 97 – “Penetrations shown on Construction Documents…fire resistive rating is not reduced”
    - “…F-Rating and T-Rating not less than 1 hour, but not less than the required rating of the floor penetrated…”
    - SBC 97 – “information on plans”
    - “Maintain hourly ratings of fire resistance rated assemblies…..ASTM E 814 Systems
      - All codes require tested and listed systems...
    - Trend – Standards for penetration clearances to walls/ceilings
Firestop Systems

- Compartmentation and US Building Codes - “Firestopping Points”
  - BOCA, UBC, SBCCI…Firestopping..Exceptions ...
    - Exception…..where the penetrating items are steel, ferrous or copper pipes or steel conduits, the annular space shall be protected as follows:
      - In concrete or masonry….maximum 6”, opening is max 144 sq.in., concrete, grout, or mortar shall be permitted when installed full thickness of the wall, or the thickness required to maintain the fire rating, or….
    - Exception also in IBC
Firestop Systems

♦ Compartmentation and US Building Codes - “Firestopping Points”
  – BOCA, UBC, SBCCI…similar language..
    • Membrane Penetrations – of steel,…..is protected to prevent the free passage of flame and the products of combustion.
    • Membrane penetrations for electrical outlet boxes of any material are permitted, provide that such boxes are tested for use in fire resistive assemblies and installed in accordance with the tested assembly.
  – Exception also in IBC
Firestop Systems

- Compartmentation and US Building Codes
  “Smoke Resistance Rated Assemblies”
  - BOCA 99, IBC – “1 hour fire resistance rated assembly, continuously sealed top to bottom, side to side”……..
  - NFPA – “Continuity Required, Sealed….”

- Firestop Industry Smoke Seal – “L Rating”
International Family of Codes

IBC – 2003 Reference Standards

- E 119-00  Test Methods for Fire Tests of Building Construction and Materials
- E 814-00  Test Method of Fire Tests of Through-penetration Firestops
- E1966-01  Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes
- UL1479-94 Fire Tests of Through-Penetration Firestops
- 2079-98 Tests for Fire Resistance of Building Joint Systems
- 2307-04 Test for Perimeter Fire Protection (2006 IBC)
Firestop Systems

- Compartmentation and US Building Codes
- “Interior & Exterior Fire Walls” – 705 - IBC
  - Structural Stability – Fire walls shall allow collapse of construction, either side, for the time indicated by the required fire resistance rating.
  - Materials - shall be of any approved non combustible materials
  - NFPA Chapter 8 Similar
Firestop Systems

♦ US Building Codes - International Building Code
  – Chapter 7 – Fire Resistance Rated Construction
    • Section 705 Fire Walls – Detailed Description
      – 705.1 “…Complete Separation…party walls constructed without openings.
      – 705.2 “…Fire walls shall have sufficient structural stability…collapse of construction on either side, not affect.
      – 705.5.5-6 – “Continuity Issues of Fire Walls in buildings”.
      – 705.9 – “Penetrations through fire walls shall comply with Section 711, Joints, 712….”
Firestop Systems

- Compartmentation and US Building Codes
  - IBC and NFPA Fire Barriers

“Continuity” - NFPA

- Outside wall to outside wall
- Floor below to a roof above
- From fire barrier wall to another fire barrier wall
- Combination thereof….
  - Continuous through concealed spaces…except interstitial
Firestop Systems

- Compartmentation and US Building Codes
  - 708 Fire Partitions – 708.3.....the fire resistance rating of the walls shall be one hour...
  - 708.4 – Continuity – fire partitions shall extend from the top of the floor assembly below to the underside of the floor/roof slab above or to the fire resistive rated floor/ceiling or roof/ceiling assembly above, and shall be securely attached thereto....
Firestop Systems

- US Building Codes- International Building Code
  - Chapter 7 – Fire Resistance Rated Construction
  Section 706 Fire Barriers – Vertical Exit Enclosures, Exit Passageways, Horizontal Exits, ….separations.
  
  - 706.4 – Continuity – “Fire barriers shall extend from the top of the floor/ceiling assembly below to the underside of the floor slab / roof deck above, and shall be securely attached.”
  - 706.7 – Penetrations to comply with Section 711, Joints 712
  - Section 707 Shaft and Vertical Exit Enclosures
    - Similar to Fire Barriers
Firestop Systems

- US Building Codes- International Building Code
  - Chapter 7 – Fire Resistance Rated Construction
  
  Section 708 Fire Partitions –
  
  Fire Resistance Rating – 1 hour

  - 708.4 – Continuity - ….Top, bottom, side to side, attached.
  - 708.7 Penetrations – Comply with Section 711, Joints 712
  - Section 710 Horizontal Assemblies – Same as walls
Firestop Systems

♦ Compartmentation and US Building Codes
  – 709 Smoke Barriers…shall be of materials permitted by the building type of construction…
  – 709.3 – Fire Resistance Rating – A 1 hour fire resistance rating is required for smoke barriers…
  – 709.4 – Continuity…Smoke Barriers shall form an effective membrane, continuous from outside wall to outside wall and from floor slab to floor or roof deck above….
Firestop Systems

- US Building Codes - International Building Code
  Chapter 7 – Fire Resistance Rated Construction
  Section 711 Penetrations
  - 711.2 – Installation Details – “Sleeves securely fastened, Insulation and coverings part of tested system…”
  - 711.3.1 – “Exceptions to firestopping penetrations…”
    - Steel, Ferrous, Copper, Steel Conduits - <6”, opening <144 sq.in., concrete, grout, etc., “full thickness of wall”, or annular space protected to ASTM E 119.
  - 711.3.1.2 – Fire Resistance Rated Assemblies – Through Penetrations to be protected by an…Firestop System, ASTM E 814, positive pressure, F Rating not <penetrated assembly”
Firestop Systems

- Compartmentation and US Building Codes

Smoke Barrier Identification

May be required……..

• 1 and 2 Hour Assembly
• Identified on Plans
702 DEFINITIONS:

THROUGH-PENETRATION FIRESTOP SYSTEM. An assemblage of specific materials or products that are designed, tested, and fire-resistance rated to resist for a prescribed period of time the spread of fire through penetrations. The F and T rating criteria for penetration firestop systems shall be in accordance with ASTM E 814.

FIRE-RESISTANT JOINT SYSTEM. An assemblage of specific materials or products that are designed, tested, and fire-resistance rated in accordance with either ASTM E 1966 or UL 2079 to resist for a prescribed period of time the passage of fire through joints made in or between fire-resistance-rated assemblies.
SECTION 712 PENETRATIONS

712.3 Fire-resistance-rated walls. Penetrations into or through fire walls, fire barriers, smoke barrier walls, and fire partitions shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water and shall have an F rating of not less than the required fire-resistance rating of the wall penetrated.
712.4 Horizontal assemblies. Penetrations of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly

712.4.1.2 Through-penetration firestop system. Through penetrations shall be protected by an approved through-penetration firestop system installed and tested in accordance with ASTM E814 or UL1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water. The system shall have an F rating and a T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

Exception: Floor penetrations contained and located within the cavity of a wall do not require a T rating.
SECTION 713 FIRE-RESISTANT JOINT SYSTEMS

713.1 General. Joints installed in or between fire-resistance rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed.

- Fire-resistant joint systems shall be tested in accordance with Section 713.3.

- The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 713.4.
713.3 Fire test criteria. Fire-resistant joint systems shall be tested in accordance with the requirements of either ASTM E1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests. When evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the building official, the wall need not be subjected to tests from the opposite side.

Exception: For exterior walls with a horizontal fire separation distance greater than 5 feet (1524 mm), the joint system shall be required to be tested for interior fire exposure only.

♦ 713.4 Exterior curtain wall/floor intersection.

Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved material or system to prevent the interior spread of fire. Such material or systems shall be securely installed and capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (0.254 mm) of water column (2.5 Pa) for the time period at least equal to the fire-resistance rating of the floor assembly. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 704.9.

- 713.4 Exterior curtain wall/floor intersection.
- IBC 2006 Code Cycle
  - Added reference to ASTM E 2307-04
Firestop Systems

- Compartmentation and US Building Codes
- US Building Codes - NFPA 5000

NFPA – National Fire Protection Association
“Consensus, ANSI Codes”
Firestop Systems

♦ Compartmentation and US Building Codes

US Building Codes - NFPA 5000

NFPA 5000

• Summary…..basically same firestopping language as ICC code, with differences in height and area tables…..

• Some difference in NFPA 101, Life Safety Code
Firestop Systems

US Building Codes - NFPA 5000

Codes that are part of NFPA 5000

- NFPA 70 – National Electrical Code
- NFPA 1 – Uniform Fire Code
- Uniform Plumbing Code
- NFPA 59 – Liquefied Petroleum Gas Code
- NFPA 54 – National Fuel Gas Code
- Uniform Mechanical Code
- NFPA 30 – Flammable and Combustible Liquids Code
- NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages
- NFPA 900, Building Energy Code
Firestop Systems

Where is firestop used?

- Perimeter
- Fire Barrier Joint
- Architectural
- Expansion Joint
- Electrical
- Bus Ducts
- Outlets
- Plumbing/Mechanical
- Sprinklers
- Block-Outs
- Insulated Pipe
- A/C Ducts
- Barrier Joints
- Fire Doors
Any penetration or gap in a fire barrier can become a thruway for flames, smoke, and deadly gases.
Firestop Systems

Penetrating Item(s)

- Pipe – Insulated and Non-insulated
  - Metal – steel, cast iron, copper, aluminum, all types
  - Plastic – CPVC, PVC, CCPVC, ABS, all types
- Cables
  - Power, control, telephone, fiber optic
- Bus duct
- Cable Trays
- HVAC
  - Round
  - Rectangular
  - Non-insulated
Firestop Systems

Effective Compartmentation and Firestopping

♦ First Interstate Bank – 1988 Los Angeles
  – $50,000,000, 30 Injuries
    • “Lack of or improperly installed firestops”

♦ Meridian Plaza – 1991 Philadelphia
  – $Multi Billion Lawsuit, 3 Deaths

♦ MGM Grand Hotel – 1980 Las Vegas
  – 85 Deaths – Smoke Travel, Ducts / Elevator Shafts
Firestop Systems

Majority of deaths were between the 20th and 25th floors.
Firestop Systems

Effective Compartmentation and Firestopping

Importance of Firestop Systems

“Completes Compartmentation Concept”

• Continuity of Operations
• Protect Property – Losses
• Fire and Life Safety
  – Egress
  – Fire and Smoke Protection
Firestop Systems

Effective Compartmentation and Firestopping

Total Fire Protection Design

Complimentary Systems

- Effective Compartmentation
- Fire and Smoke Alarm Systems
- Active Fire Sprinkler Suppression and Control Systems
- Human Factors
  - Building Layout
  - Education
  - Fire Department Management
Firestop Systems

Effective Compartmentation and Firestopping

“Firestopping Market” – Characteristics

– Material Sales - $170,000,000 – $220,000,000
  • Growth 5% - 20% Per Year
– Firestop Contracting Market
  • Growing Rapidly – 30%+ yearly
– Firestop Systems Installed to Description?
  • Quality Control Protocol
  • Firestop Systems Installation Protocol – FM 4991
  • Firestop Inspection Standard – ASTM E 2174 & ASTM E 2393
Firestop Systems

History of Specifications

- Require Submittals
- Require Independent Inspection
- Require Systems Documentation
- Require Qualified or Approved Contractors

Enforcement – Varies

- Contractor Responses
  - “I installed the caulk”
  - “What’s a tested and listed systems”
  - “It’s red, it’s okay”
Firestop Systems

Architects

1990 – Specified Rated Materials
1993 – Systems, Maintain Rating, Submittals
1994 – Independent Inspections
1998 – Applicator QC Program Development
  • Firestop Contractor Firm Focus
2003 – Current
  • FCIA Member
  • FM 4991 Approved Contractor
  • UL Qualified
  • ASTM E 2174 & 2393 Inspection
Firestop Systems

Firestopping Protocol

- Tested Systems

- Firestop Systems Installation Protocol
  - FM 4991 & UL QFC

- Firestop Systems Inspection Protocol
  - ASTM E 2174 & ASTM E 2393
Firestop Systems

Firestop Protocol = “Show me the systems”

- Plan Review
- Estimates
- Submittals
- Jobsite Crew
- “As Built” Details
  - Tested Systems
  - Engineering Judgments / EFFRA’s
- Owner Record and Maintenance Documents
Firestop Systems

♦ Common Responses to Protocol

“What details?”

“We’re doing the best we can.”

“We installed the caulk.”

“What’s a firestop system?”

“We used a Tested and Listed Firestop System with F, T, L ratings, movement capabilities that meet specification and building requirements.”
Firestop Systems
The Firestopping Process

Proper ‘**DIIM**’ Effective Compartmentation Means Reliable Systems…

- **Designed** - A/E, Firestop Consultant
  - Tested and Listed Systems, FCIA Member Mfr’s.
- **Properly Installed**
  - FCIA Member, “FM 4991, or UL QFC Contractors”
- **Properly Inspected**
  - ASTM E 2174 & ASTM E 2393 Inspection
- **Properly Maintained** –
  - FCIA Member
Firestop Systems

- Fire Testing and Qualifications
  - ASTM E 119 – Walls and Floors
  - ASTM E 814 / UL 1479 - Penetrations
  - UL 2079 - Joints
  - ASTM E 2307 - Multi Story Test Apparatus - Perimeter
  - Engineering Judgments – UL, MFR, Others
  - Equivalent Fire Resistance Rated Assemblies
Firestop Systems

- Fire Testing and Qualification Laboratories
  - Inchscape – Warnock Hershey
  - Omega Point Laboratories
  - Underwriters Laboratories
    - US
    - Canada – May or may not include hose stream test
  - Factory Mutual
  - Southwest Research Institute
  - Western Fire Testing
  - Warrington
Firestop Systems

SECTION A-A

1. Floor or Wall Assembly—Min 6-1/2 in. thick lightweight or normal weight 1100 to 1200 psi concrete. Will not be constructed of any UL Classified Concrete Block. Core of system through opening in floor or wall assembly to be 1-1/2 in. in 1-1/2 in. Larger than 1-1/2 in. of flexible metal conduit (item 2) inserted through opening. Maximum opening is 5 in.

   See Laminated Block (LAB) category in the Fire Resistance Directory for names of manufacturers.

2. Through Penetrating Product—Min 4 in. clear (or smaller) space to non 3/4 in. diam. or smaller metal or flexible metal conduit. Flexible metal conduit must be installed near center of circular through opening in floor or wall assembly. Flexible metal conduit to be slightly supported on both sides of floor or wall assembly.

Alliance Cable Corp.

3. Filling Material—Min 1 in. thickness of non-combustible fire blanket or mineral wool batt insulation firmly packed into opening as a permanent item. During installation to be removed at least 4 in. from top surface of floor or from both surfaces of wall.

4. Fill Walls at Cavity Material—Caulk—Applied at fill the annular space around the flexible metal conduit. In floor, a min 2 in. length of fill material to be installed flush with the surface of floor. In walls, a min 1 in. thickness for walls is to be installed flush with wall surface on both sides of wall assembly.

   Omega Point Laboratories

UL Working for a safer world
Firestop Systems

♦ Firestop Systems Definition
  – “A Specific field erected construction, consisting of an assemblage of materials to prevent the spread of fire through openings in fire rated walls and floors using ASTM E 814 / UL 1479, UL 2079, E 2307 as the test method…”
  – Testing = Suitability statement for use of a firestop product in a specific system application
What are Firestop Systems?
– ASTM E814/UL 1479–UL S115 Tested Systems
  • F Rating - Flame
  • T Rating – Temperature
  • H Rating – Hose (UL Mandatory; CAN not)
  • L Rating – Smoke
  • W Rating – Water
Firestop Systems
Hose Stream
& “W” Rating
Firestop Systems

- Fire Testing and Qualification Laboratories
  - Manufacturers Testing Laboratories
    - 3M Fire Protection Products
    - HILTI, Inc.
    - Specified Technologies, Inc.
    - RectorSeal

*May be listed in directory, if witnessed by testing laboratory personnel*
Firestop Systems

- Firestop Joint Systems Definition
  - “A joint system is a specific construction consisting of adjacent wall and floor assemblies and the materials designed to prevent the spread of fire through a linear opening between the wall and/or floor assemblies”

ANSI / UL 2079
Firestop Systems

- Firestop Joint Systems Definition
  "ANSI / UL 2079"
  - Min. Positive Pressure – .01 Water, 12” below assy
  - Movement Cycling
    - Class I – min. 500 cycles, 1 cycle / minute
    - Class II- min. 500 cycles, 10 cycles / minute
    - Class III-min 100 cycles, 30 cycles / minute
  - Fire Tested at Maximum Joint Width
  - No Load Bearing Characteristics, unless noted
Firestop Systems

- Firestop Perimeter Systems Definition
  - “A Perimeter Fire Containment System is a specific field erected construction consisting of a floor with a fire resistance rating, and an exterior curtainwall with no hourly resistance rating, and the fill material installed between the floor and the curtain wall to prevent the vertical spread of fire in a building.”
  - ASTM E 2307
Firestop Systems

- **Firestop Perimeter Systems Definition**
  - Movement Classes = ANSI / UL 2079
  - Ratings
    - Integrity – Similar to “F” Rating
    - Insulation – Similar to “T” Rating
    - “L Ratings” – Also available
  - Curtain Wall Spandrel Panels
    - Protected with insulation, other fire resistive systems
  - ASTM E 2307 – Perimeter Slot Testing Standard
Firestop Systems

Firestop Systems Directories - UL®

**Alpha:** The first letter is either “F” for floors, “W” for walls or “C” for a combination of walls and floors.

**Alpha:** The second letter or combination of letters, signify the following.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Concrete floors &lt; 5”</td>
</tr>
<tr>
<td>B</td>
<td>Concrete floors &gt; 5”</td>
</tr>
<tr>
<td>C</td>
<td>Frame floors</td>
</tr>
<tr>
<td>D</td>
<td>Deck construction</td>
</tr>
<tr>
<td>E – I</td>
<td>Reserved for future use</td>
</tr>
<tr>
<td>J</td>
<td>Concrete or Masonry walls &lt; 8”</td>
</tr>
<tr>
<td>K</td>
<td>Concrete or Masonry walls &gt; 8”</td>
</tr>
<tr>
<td>L</td>
<td>Framed Walls</td>
</tr>
<tr>
<td>M</td>
<td>Bulkheads</td>
</tr>
<tr>
<td>N – Z</td>
<td>Reserved for future use</td>
</tr>
</tbody>
</table>
Firestop Systems

- Firestop Systems Directories - UL®
  - F - Floors
  - W - Walls
  - C - Combination
  - A - Concrete floors < 5 inches
  - B - Concrete floors > 5 inches
  - C - Frame floors
  - D - Deck construction
  - E - I - Reserved for future use
  - J - Concrete or Masonry walls < 8 inches
  - K - Concrete or Masonry walls > 8 inches
  - L - Framed Walls
  - M - Bulkheads
  - N - Z - Reserved for future use

First letter of the system
Firestop Systems

- **Numeric:** The first digit of the four digit number, identifies the type of penetrant in accordance with the following list. The next three digits will be assigned sequentially to successfully tested systems.
  - 0000 – 0999 No Penetrant
  - 1000 – 1999 Metallic Pipe, Conduit or Tube
  - 2000 – 2999 Non Metallic Pipe, Conduit or Tube
  - 3000 – 3999 Cables
  - 4000 – 4999 Cables in a Tray
  - 5000 – 5999 Insulated Pipes
  - 6000 – 6999 Misc. Electrical Penetrates
  - 7000 – 7999 Misc. Mechanical Penetrates
  - 8000 – 8999 Mixed multiple penetrates
  - 9000 – 9999 Reserved for future use
UL Systems

Example: CAJ 1155
Metal Pipe in
Concrete Floor
or Wall
First Letter: C-AJ-1155

- Represents WHAT is being penetrated:
  - F = Floors
  - W = Walls
  - C = Floors and walls(combined)

Metal Pipe in Concrete Floor or Wall

C-AJ-1155
Second Letter(s): C-AJ-1155

- Provide more info on Wall/Floor
  - A. Concrete Floors ≤ 5 inches thick
  - B. Concrete Floors > 5 inches
  - C. Framed Floors - Floor/Ceiling Assemblies...
  - J. Concrete or Masonry Walls ≤ 8 inches thick
  - K. Concrete or Masonry Wall > 8 inches thick
  - L. Framed Walls - Gypsum Wallboard Assemblies

Metal Pipe in Concrete Floor or Wall
First Digit: C-AJ-1155

- Describes the penetrating item(s)
  - 0000-0999  Blank Openings
  - 1000-1999  Metal Pipe, Conduit, or Tubing
  - 2000-2999  Nonmetallic Pipe Conduit or Tubing
  - 3000-3999  Cables
  - 4000-4999  Cable Trays
  - 5000-5999  Insulated Pipes
  - 6000-6999  Miscellaneous Electrical (Busways)
  - 7000-7999  Miscellaneous Mechanical (Ductwork)
  - 8000-8999  Mixed penetrating items
UL SYSTEM #

C= Combination wall/floor
A = Conc. floor <= 5” thick;
J= Block/Conc. wall <=8” thick

C-AJ-1155
1= Metal Pipe in Concrete Floor or Wall
Sequential test #

UL Classified Firestop Systems
How Installers Select UL Systems

- Wall or Floor Construction Type
- Wall or Floor Thickness
- Penetrating Item
- Size of the Penetrating Item
- Annular Space
- Firestop Fill Material
Every application has its own unique UL tested assembly which specifies:

- **Hourly Fire Rating**
- **Type of Barrier**
- **Type of Penetrant**
- **Min/Max Hole Size**
- **Firestop Products**
Min/Max Hole Size
1. Centered

2. Off-Centered

3. Point Contact

4. Continuous Point Contact
Firestop Systems

- Firestop Systems Directories
  - Intertek
  - UL
  - FM Approvals
Firestop Systems

- Firestop Systems Definitions
  - Tested Wall / Floor Assembly
  - Penetrating Item and Gap, “Annular Space”
  - Firestop Materials
    - Spray, backing, caulks, wrap strips, etc.

FIRESTOP SYSTEM
COMMON TO ALL SYSTEMS
Firestop Systems

- Firestopping Definitions
  - Penetrating item
  - Annular space
  - Resistance rated wall or floor assembly
  - Backing/damming
  - Fill material
  - Devices, restricting collars
  - Anchors, z-clips
Firestop Systems

- Firestop Systems Testing

ASTM E 814 / UL 1479 – Testing
  - “F” Rating – Fire Rating, Flame poke through, unexposed side, in hours.
  - “T” Rating – Time for penetrating item to raise 325F above ambient, unexposed side.
  - “L” Rating – Air Leakage through penetration at 400F and Ambient, stated in CFM/SF
  - “L” Rating Test - UL 1479 ONLY
  - “W” Rating – UL 1479 only
Firestop Systems

Manufacturer: Specified Technologies Inc.
System No.: UL C-AJ-5021
Rating: F = 2 and 3
Rating: T = 1/2 and 1
Rating: L = <1CFM/SF
Firestop Systems

- Firestop Systems Testing

Field variances to tested and listed system

- Too many penetrating items
- Annular space too large/small
- Something in the way
- Oversized penetrating item
- Oversized Insulation

Non-compliant conditions
Firestop Systems

- Firestop Systems Testing – Field Variances
- EJ / EFFRA Protocol
  - Field Crew - Discuss with supervisor
    - Find another system – same manufacturer
    - Find another system – different manufacturer
  - If neither exists:
    - *Engineering Judgment* – “EJ”
    - *Equivalent Fire Resistance Rated Assembly* – “EFFRA”
  - Written by …
    - IFC Protocol
    - UL Protocol
Firestop Systems

- Firestop Systems Testing – Field Variances

“EJ” or “EFFRA” protocol

- Contact contractor firm supervisor
- Follow IFC protocol…..
  - Check TESTED systems available
    - ALL manufacturers
  - Written by
    - Manufacturer authorized technical staff
    - Testing Lab Personnel – UL QFC
  - Opinion based on existing testing
  - Not transferable
    - Condition specific
    - Jobsite specific
    - Contractor firm specific
    - Manufacturer letterhead
Firestop Systems

- Firestop Systems Testing–Field Variance

“EJ or EFFRA” Protocol
- Submit Request to Manufacturer
- Receive EJ/EFFRA “Drawing or Letter” on Manufacturers Identified Document
- Install to Design
- Document with other Systems
Firestop Systems

- **Testing Laboratories** – US, Canada, World
  - UL & UL Canada
  - Omega Point
  - Warnock Hersey - Intertek
  - FM Global
  - Warrington

“There is no such thing as a 2 hour caulk, strip, putty, mortar, or other product.”

“Show me the system.”
Firestop Systems

- The Building Needs Firestop Systems....

“Now What” ?
Firestop Systems

- Firestop Systems Installation Protocol
  “Finding the System” – Key Points
  - Identify fire/smoke resistance rated walls/floors
  - Identify through penetrations
  - Research solutions
    - Listed wall/floor repairs
    - Firestop systems - EJ/EFRRRA’s
  - Estimate/contract
  - Submittals
  - Install systems
  - Documentation - “As Built’s”
Firestop Systems

- Firestop Systems Installation Protocol
  "Finding the System" – Key Points
  - Wall/Floor type
  - Penetrating item(s)
    - Size, type, insulation, number of items
  - Annular space/gap size
  - Hourly rating required
  - Physical properties
    - Movement capabilities
    - Moisture resistance
    - Environmental Exposure
    - Ease of installation
Firestop Systems

♦ Materials and Systems
“Finding the System & Material Selection”
  – Product Discussion
    • Description
    • Advantages
    • Disadvantages
    • Systems assemblies
    • Common usages
Firestop Systems

♦ Materials and Systems
“Finding the System” – Key Points
– Major Manufacturers
  • 3M Fire Protection Products
  • A/D Fire Protection Systems, Inc.
  • BOSS Products
  • HILTI
  • Nelson Firestop Products, Inc
  • PFPP / Johns Manville
  • Rectorseal, Inc. / Bio Fireshield
  • Specified Technologies, Inc.
  • Thermafiber, LLC
  • Tremco, Inc.
  • W.R. Grace

About 50 “Fill Material” suppliers – UL 2003
Approx. 4500 Listed Systems – UL 2003 Book
Approx 8300 Systems – UL 2008 Book
Approx 9000 Systems – UL 2012 Books
Firestop Systems

♦ Typical Penetration Firestop System
  – Penetrating item – type/size
  – Annular space – size, shape
  – Gap/joint size – all types
  – Insulation – size, type
    • Forming – backing/damming
    • Fill void or cavity materials
    • Firestop devices
Firestop Systems

- “Forming Materials”
  - Mineral Wool
  - Ceramic Fiber
  - Ceramic Fiber Boards
  - Urethane Foams
  - Backer Rods
  - Insulation – Foam, Fiberglass

- Listed for use
- “Conform to tested system or EJ/EFRRRA”
Firestop Systems
Firestop Systems
Proper Installation of Mineral Wool

- Compressed mineral wool must be inserted perpendicular to the joint to allow for movement between the slab and wall.
Properly Installed and Ready to Spray
Mineral Wool

With Sealant
Good Firestop Applications

Floor to Wall

Top of Wall
Joints and Seams
Top of Wall
Joints and Seams
I-Beam to Fluted Deck
Joints and Seams
Top of Wall and I-Beam

Great Job!
Joints and Seams
Edge of Slab
Wall to Wall / Wall to Floor
Caulk and Self Leveling
Unacceptable Substitutes
Unacceptable Substitutes

Insufficient Material?

Non Code Compliant!
Unacceptable Substitutes
Spackle is not Firestop
Floor to Wall: Concrete floor assembly to pre-cast concrete wall assembly
Poor Firestop Installation of Perimeter Barriers
Results of Improperly Installed Mineral Wool
Firestop Systems

Firestop Caulks - Sealants

- Caulks/Sealants
  - Intumescent – Expand with heat
  - Silicone Elastomeric – Ablative
  - Endothermic – Moisture Laden
  - Latex Sealants - Economical
Firestop sealant must be well bonded to penetrating item and surrounding wall or floor.

1. Pack
2. Caulk
3. Tool

Always Check BOTH SIDES
When the sealant is properly recessed, it will expand inward and work the way it was designed.
Left untooled, the sealant will expand outward during a fire, and likely fail.
Properly Tooled Penetrations
Large Insulated Pipes
Penetrations with Top of Wall
Multiple Insulated Pipes
Sleeved Pipes
Sealant must be applied BEFORE sheet metal flanges
Barriers With Fire/Smoke Dampers

- Dampers are UL listed --- *Systems*
- Must be installed according to manufacturer’s written instructions (Systems)
- Firestop sealants not miraculous –
  - Improper hole sizing or poor installation…

Consult the Damper Manufacturer & the Authority Having Jurisdiction
Fire Damper Installation

- **Annular Space**
  - space between damper and inside of barrier
  - 1/8” per linear foot
  - minimum: 1/4”
  - maximum: 3” on each side

- Greenheck tests dampers **WITHOUT** any sealant or caulk in annular space

- Sealant is acceptable but must be approved by local authority
  - Greenheck Slide
Fire Damper Installation

- Retaining angles
  - Retain
  - Prevent sight-through
- 1 in. overlap of barrier
- Attach angles to sleeve only
- All four sides of sleeve
- Both sides of barrier is standard
  - Greenheck Slide
Single Side Retaining Angle

♦ Requirements
  – Vertical
    – 80” x 50” max or
    – 40” x 100” max or
    – 50” x 80” max
  – Horizontal
    – 144” x 96” max

♦ Angle Secured to Sleeve and Barrier

• Greenheck Slide
Breakaway Connections

- Traditional - Transverse Joints
  
  - Plain “S” Slip
  - Hemmed “S” Slip
  - Double “S” Slip
  
  - Inside Slip Joint
  - Standing “S”
  - Standing “S” (Alt.)
  
  - Standing “S” (Alt.) (Bar Reinforced)
  - Standing “S” (Angle Reinforced)
Breakaway Connections

- Manufactured
  - Ductmate
  - Ward
  - Nexus

- Proprietary
  - TDC by Lockformer
  - TDF by Engle

- Greenheck Slide
Firestop Installation

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Underfloor applications
- Max. size 72” W x 96” H

- Greenheck Slide
Barriers With Fire/Smoke Dampers

- Dampers with sealant provide smoke protection

Consult the Damper Manufacturer & the Authority Having Jurisdiction
Installing an Incorrect System May Void the Manufacturer’s Warranty
Barriers With Combustible Penetrants

- Plastic Pipe
- Plastic-Jacketed cables
- Certain pipe insulation
Firestop Systems

Firestop sealant must be well bonded to penetrating item and surrounding wall or floor
Firestop Systems
Firestop Caulks - Sealants

- Latex Firestop Caulks – Non-intumescent

Advantages
- Tested systems available
- Water Based – Easy cleanup
- Reduced costs

Disadvantages
- Low Movement Capability
- Washout if not cured before exposure to water
- Adhesion vs. Silicone
- Storage & Installation Temp above 40F (or higher)
Firestop Systems

Firestop Caulks - Sealants

- Intumescent Caulks / Sealants
  - Graphite and Sodium Silicate based “Intumescent”
  - Acrylics and Silicones
  - Expands 2 – 10+ Times when heated
Firestop Systems
Firestop Caulks - Sealants

♦ Intumescent Caulks

Advantages
- Many Tested Systems
- Eliminates wrap strips
- Expands to fill voids
- Used on combustible penetrants

Disadvantages
- Latex Base = Washout
- Shrinkage
- Less adhesion than silicones
- Tooling Difficulty
- Increased Cost
- Heavy, may sag
- Temperature sensitive
Firestop Systems
Firestop Caulks - Sealants
Firestop Systems
Firestop Caulks - Sealants
The Correct Amount of Sealant Must Be Used

- **Less than Required by UL:** May not be enough intumescent force to expand into a strong char. Seal may fail earlier than designed.
- **More than Required by UL:** Intumescent material may expand itself right out of the hole, leaving the opening unprotected, or damage the wall.
- **Amount Required by UL:** Sealant will expand into an insulative char, and work to block the fire on the hot side
Firestop Systems
Firestop Putties

- Intumescent Putties
  - Hand moldable intumescent "putties"
Firestop Systems
Firestop Putties

♦ Advantages
  – Tested Systems
  – Hand Applied for hard to reach areas
  – No tools required
  – Reusable/ Re-enterable

♦ Disadvantages
  – Limited Testing
  – Limited Annular Space sizes tested
  – More labor than sealants
  – Less Adhesion, flexibility
Firestop Systems
Firestop Putties
Firestop Putty Stick
Firestop Systems

Firestop Putties

♦ Putty Pads
  - Flat, moldable putty for around electrical box openings
    • Back to Back
    • Less than 6” apart, “one side of wall to the other”
Firestop Systems
Silicone Elastomeric Sealants

- Silicone Elastomeric Sealants
  - Neutral or oxime cure silicone sealant systems
Firestop Systems
Silicon Elastomeric Sealants

♦ Advantages
  – Flexible to + (-) 40%
  – Shrinkage - Minimal
  – Weather/Water Resistant
  – Adhesion – substrates
  – No “Washout”
  – Service Temperature

♦ Disadvantages
  – Minimal combustible penetrating items, cables
  – Limited Tested Systems – plastics
  – Not Paintable, w/o silicone paint
  – Some building occupancies do not allow
    • Industrial
    • Other
  – Patching?
Firestop Systems
Silicone Elastomeric Sealants

SECTION A-A

SECTION A-A
1. **Floor Assembly** The fire-rated fluted steel deck/concrete floor assembly shall be constructed of the materials and in the manner described in the individual Floor-Ceiling Design in the UL Fire Resistance Directory and shall include the following construction features:

2. A. **Steel Floor And Form Units*** Max 3 in. deep min 22 ga galv or phos/painted steel fluted units. B. **Concrete** Min 3 in. thick reinforced concrete, as measured from the top plane of the floor units.

3. **Wall Assembly** Min 5-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) structural concrete. Wall may also be constructed of any UL Classified **Concrete Blocks***. See **Concrete Blocks** (CAZT) category in the Fire Resistance Directory for names of manufacturers.

4. **Joint System** — Max separation between bottom of floor and top of wall (at the time of installation of the joint system) is 1 in. The joint system is designed to accommodate a max 25 percent compression from its installed width. The joint system consists of a forming material and a fill material in the flutes of the steel floor units and between the top of the wall and bottom of the steel floor units, as follows:

5. A. **Forming Material*** Min 3-1/2 in. thickness of min 4 pcf density mineral wool batt insulation for 1 hr Rated Design, min 4-1/2 in. thickness for 2 hr Rated Design, firmly packed into flutes of the steel floor units and between the top of the wall and bottom of the steel floor units, and recessed from each surface of wall to accommodate the required thickness of fill material. Mineral wool batts packed into opening horizontally with a min 25 percent compression. **FIBREX INSULATIONS INC** — FBX Safing Insulation

6. **OWENS CORNING HT INC, DIV OF**

7. **OWENS CORNING** — Safing Insulation/MW

8. **ROCK WOOL MANUFACTURING CO** — Delta Board.
Firestop Systems
HW-D - 0013

1. OWENS CORNING HT INC, DIV OF
2. OWENS CORNING — Safing Insulation/MW
3. ROCK WOOL MANUFACTURING CO — Delta Board.
5. THERMAFIBER L L C — Type SAF
7. B. Fill, Void or Cavity Material* Min 1/2 in. thickness of fill material installed on each side of the wall in the flutes of the steel floor units and between the top of the wall and the bottom of the steel floor units, flush with each surface of wall. 3M COMPANY — FB-2000
10. *Bearing the UL Classification Mark
Firestop Systems
Silicone Foams

- Silicone Foams
  - 2 part, catalyst cured seal
    - Pours, sprays like a liquid;
    - “Foams in 1 – 3 minutes”
  - Early Technology
  - Nuclear Power Plants - Worldwide
Firestop Systems
Silicone Foams

♦ Advantages
  – Liquid Flows around hard to reach areas
  – Many tested systems – Electrical
  – Re-penetrable
  – “Air / Moisture seal”

♦ Disadvantages
  – Forming Material must be tight or else
  – Application Temperature – 65F- 80F
  – Pumps for high production
Firestop Systems
Silicone Foams

- Silicone Foam Sealant
- Metallic Pipe or Conduit
- Ceramic Board Damming: May or May Not Be Part of Design
Firestop Systems

Firestop Mortars

- Unexpanded Vermiculite or Perlite Concrete
- Specialty Foam Concretes
- Lightweight Aggregate Concretes
- Gypsum / Iron Ore Mortar
Firestop Systems

Firestop Mortars

- Advantages
  - Cost Effective
  - Tested Systems
  - Pourable
  - Supported with lightweight materials

- Disadvantages
  - No movement abilities
  - Not compatible with Copper Piping
  - Not Re-penetrable
  - Thickness – 2” to 4”
  - Mixing Ratios – Q/C
  - Mixing Time
  - Termperature sensitive
Firestop Systems
Firestop Mortars

[Diagram showing firestop mortar material around a conduit and a pipe, labeled as follows: MORTAR FIRESTOP MATERIAL, CABLE TRAY, CONDUIT, PIPE]
Firestop Mortar in CMU Wall
Before

After with Firestop Mortar
Firestop Systems

Endothermic – Ceramic Caulks

♦ Endothermic Systems use laden moisture to “firestop”

♦ Ceramic Fiber Systems use high temperature resistance to “firestop”
Firestop Systems
Endothermic – Ceramic Caulks

♦ Advantages
  – High Service Temperature – 2000F+
  – Heavy Density
  – Less prone to washout
  – Hand or gun applied

♦ Disadvantages
  – Limited Testing
  – Cures Hard
  – Not Flexible
  – Not pourable
Firestop Systems
Endothermic – Ceramic Caulks
Firestop Systems
Spray – Brush Systems

- Latex Spray Systems - for use around piping, as a fire break on cables, or walltops, joints, and perimeter fire protection systems
  - Airless Sprayers
  - Nozzle Tips
Firestop Systems
Spray – Brush Systems

♦ Advantages
  – Thin Coatings
  – Flexible
  – Tested Systems
  – Cost Effective
  – Paintable

♦ Disadvantages
  – Thin = No margin for design / application error
  – Non Intumescent
  – May require equipment
  – Thickness Quality Control Difficult
  – Temperature Sensitive
Firestop Systems
Spray – Brush Systems

1. Floor use wall assembly.
   1A. AC, C, or U in. 4 in. wall or U in. concrete deck capable of providing a 2-Hr. rating.

2. Vertical rectangular aluminum framing (min) 5.3x2.5 in. spaced a min. 10 in. o.c.

3. Horizontal rectangular aluminum framing (brackets) min. 5.3x2.5 in. spaced a min. 34 in. o.c. From each 4 in. to 7/2 in. above floor surface and 1 in. min. 13–3/4 in. below ceiling surface.

4. Min. 1/4 in. heat-strengthened clear or tempered glass panel.

5. Min. 18 ga. 3-1/2 in. long steel angle horizontally located at the extremities of the firestop mineral wool (item 6). The angle must have a min. 12 in. unbroken leg at each end forming a U shape. Legs fastened to members with steel screws. Angle required for 2 in. curtain wall insulation and recommended for 4 in. curtain wall insulation (item 17).

6. Nom. 2 in. (8 pc) or 4 in. (4 pc) foil-bonded mineral wool batts lightly fit between framing members (min. 1/4 in. larger than framing member spacing) in vertical area. Finish flush with interior face of framing members. Nom. 2 in. curtain wall insulation must be mechanically attached. 2 in. vertical framing.

7. Min. 1 in. by 4 in. wide (6 pc) foil-bonded mineral wool batts centered over vertical framing members and attached with impinging pins spaced a min. 12 in. o.c.

2A. Conduit. Min. 8 in. joint width between floor and nearest edge of mineral and curtain wall insulation. Joint was tested to a horizontal movement of 30% (compares with expansion). Pivots to a horizontal movement of 30% and 30% (compares with expansion).

3. Firestopping. - FormSeal® FS 3000 Series Coating.
   3A. Mineral wool (4 pc) compressed and 1-1/8 min. 0.068 into joint between floor and curtain wall insulation to a max. 2 in. depth and finish flush with floor surface.

3B. All floor surface apply FS 3000 over joins a min. 0/16 in. thick (see), overlapping floor surface and curious wall insulation surf ace a min. 1/8 in.

Notes
1. This series drawing is provided to aid in the installation and selection of the GPL design. The user shall refer back to the GPL list of design for complete information required for assembly and operation purposes.

2. System design evaluated to the ASTM E333.1-04 standard test method of dynamic perimeter barrier.

3. Please refer to the GPL Firestopping Directory for components requiring GPL classification.

Grace Construction Products

G.A. Grace & Co. 
63 Waltham Ave 
Cambridge, MA 02138 
Phone: 866-335-9786 
Fax: 866-257-498-9786 
E-mail: info@formseal.com

This website has been independently evaluated by nationally recognized testing laboratories. The results of the tests are documented in this report and are available upon request.

The information contained herein is not intended to be exhaustive, but it is the user's responsibility to determine the suitability of the products for their intended use. Please contact the manufacturer's representative for any questions regarding the use of this product.

9-005
Firestop Systems
Spray – Brush Systems
Firestop Systems
Track Systems
Firestop Systems

Track Systems

♦ Advantages
  – Fast Installation

♦ Disadvantages
  – Sealant to attain “L” Ratings
  – Late in Project
Firestop Systems

Intumescent Products

- Caulks / Sealants *
- Putty *
- Wrap Strips
- Firestop Devices
- Sealbags, Blocs
Barriers With Plastic Pipes

- PVC burns fairly predictably, slowly melting and collapsing

- ABS, FRPP (fire retardant polypropylene), and PVDF are much more unstable, and can be very difficult to control in a fire.

- “Cellular Core” or “Foam Core” are extraordinarily combustible, and difficult to firestop.

- The different firestop requirements for each of these is spelled out in the UL System
Firestop Systems
Intumescent Wrap Strips

♦ Advantages
  – Contractor Fabricated
    • “Roll your Own”
  – Variable Annular Space Solutions
  – “In Hole Systems” eliminate devices
  – Allows use of large, combustible penetrants
  – Utility Product for Cable Trays, multiple pipes

♦ Disadvantages
  – Contractor Fabricated
  – Labor intensive
Firestop Systems
Intumescent Wrap Strips and Steel Collars
Firestop Systems
Intumescent Wrap Strips and Steel Collars

♦ Advantages
  – Many tested systems
  – Variable annular space
  – Contractor assembly
  – Custom sizes

♦ Disadvantages
  – Exposed to ceiling
  – Service temperatures
  – Multi handed job without adhesives on strips
  – Hand assembly
    • Strips
    • Collar
    • Bands
Correct Collar or Sealant Must Be Selected for Combustible Penetrations

- Intumescent sealant expands and fills the void that opens as the combustibles burn away
- Collar expands to crush the pipe
Firestop Systems
Intumescent Wrap Strips and Steel Collars

♦ Key Points - Restricting Collars
– Fastening Tabs, Directional Tabs, Bands

Sheet metal commonly supplied in rolls
Firestop Systems
Intumescent Wrap Strips and Steel Collars

♦ Advantages
  – Pre-assembled
  – Many sizes
  – Easy to hang
  – Factory Q/A
  – Through Wall “Cans” allow angled pipes

♦ Disadvantages
  – Limited sizes
  – Clearance required away from walls, floors
  – Bottom side only
  – Annular space sizes
Properly Firestopped Penetrations
Firestop Systems
Firestop Devices

- Fire Cans, Collars - Preformed
Firestop Systems

Firestop Pre-formed “Ball” Devices

♦ “Pre-Formed “Y” Devices
  – Polyethylene film holds ball. Heat melts film, ball drops = Firestop
Firestop Systems

Firestop Devices

- Preformed Devices – Cast in Place, Bathtub
Firestop Systems
Firestop Pre-formed Electrical Devices

- “Pre assembled, preformed molding kits in stainless steel frames, mechanically sealed”
- “Pre-assembled Open Pathway Devices”
Firestop Systems
Firestop Pre-formed Electrical Devices

♦ Advantages – Sealed
  – Stainless Steel Frame = Impressive Look
  – Navy Approved – Pressure Seals
  – Highly Engineered
  – Easy Re-penetration
  – No Sealants

♦ Disadvantages – Sealed
  – Cable Size Specific to mold size
  – Labor intensive
  – Expensive

PRE-MOLDED INTUMESCENT FIRESTOP DEVICE

ELASTOMER INSERTS ENCAPSULATE INDIVIDUAL CABLES
Advantages – Open
- Extremely Cost Effective
- Easy Re-penetration
- No Sealant, putty, caulk required

Disadvantages – Open
- “L” Ratings?
- Open Penetration until intumescent activates
Firestop Systems

Firestop Pre-molded Mechanical Devices

- EPDM rubber pieces
- Toggle bolts and screws
- Compression Fit
Firestop Systems
Firestop Mechanical Seal Devices

♦ Pre-Formed “Rubber” Devices
  – Advantages
    • Developed From Water, Pressure Seals
    • Non Caulk System – No curing
    • Factory Controlled System
    • Water, Pressure Seals
  – Disadvantages
    • Labor intensive
Firestop Systems

Firestop Composite Sheets

- Sheet metal laminated to intumescent material with foil and metal scrim on the other side
Firestop Systems
Firestop Composite Sheets

♦ Advantages
  – Large Openings
  – Multiple Penetrants
    • Cable and cable trays, piping, etc.
  – Versatile tested systems
  – “Utility Product”

♦ Disadvantages
  – Labor Intensive
  – Fastening, cutting, caulking/sealants, wrap strips
Firestop Systems

Firestop Sealbags

- Unexpanded vermiculite bags
- Intumescent coated, bagged mineral wool
Firestop Systems
Firestop Sealbags

♦ Advantages
  – Easy Installation, “in hard to get to areas”
  – Re-penetrable
  – Tested Systems
  – Multiple Penetrating Items

♦ Disadvantages
  – Stacked to strict specifications
  – Floors Difficult
  – Water Seal??
  – Metal Lath may be required
  – “L” & “W” Ratings

Note that sleeves, intumescent sealant or wire mesh may also be required.
Firestop Systems
Firestop Intumescent Foam Blocks

Advantages
- Easy installation
- Re-penetrable
- Tested Systems
- Multiple penetrating items

♦ Disadvantages
- Sticky
- L Ratings if not installed properly
Room for future growth

*Refer to UL System or Engineering Judgment for Possible Wire Mesh Requirements
Fire Block in Large Openings
Intumescent Firestop Board & Block

*Refer to UL System or Engineering Judgment for Possible Wire Mesh Requirements
Re-enterable Systems
Firestop Systems

Unlisted, Untested Firestop Systems

- Concrete / Grouts / Masonry Mortar
- Drywall Compound
- Loose Insulation and Caulk
- Mineral Wool and Caulk
- Urethane Foams

“Not Suitable for Firestop System – unless allowed by code ... ”
Firestop Systems
Unlisted, Untested Firestop Systems
Firestop Systems
Unlisted, Untested Firestop Systems

♦ Quality Processes for Firestopping
  – It is a Firestop System
  – It isn’t a Firestop System

  – How to tell…………
Firestop Systems
Unlisted, Untested Firestop Systems
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Firestop Systems
Unlisted, Untested Firestop Systems
Styrofoam Block in CMU Slab
Joint Compound
Concrete, Mortar, or Grout?

Non UL Compliant!
Creative but Ineffective Substitute
Joint Spray On Joints NOT Pens!
Another creative attempt
Incomplete is ineffective
Incomplete is ineffective.
Right Product,
Incomplete Installation
How many gallons of gas/BTU’s does this equal?
Sleeves with No Firestop
Foam

Great Stuff
Foam Must Be Removed

Then Properly Firestopped
TRAGIC RESULT: One Meridian Plaza
Philadelphia, PA February 23, 1991

- Foam used to “firestop” opening to mechanical room on 20th floor
- Fire quickly spread knocking out power
- Back-up generator failed
- Water pressure inadequate
- 40 story building destroyed
$800 Million Potential Claimed

- Tenants and nearby businesses sued for damages
- General contractor, subcontractors and manufacturers sued
Liability

♦ General Contractor: $40 million
  – Failure to supervise, install, and inspect

♦ Alarm Manufacturer & Servicer: $10 million
  – Inadequate alarm system

♦ Back-up Generator Manufacturer & Servicer
  – Faulty wiring
Materials and Systems

- Documentation Requirements
  - Tested and Listed Systems / Fire Resistance Rated Assembly (FRRA)
  - Engineering Judgments / Equivalent Fire Resistance Rated Assembly (EFRRA)
  - Number of Penetrations Treated by type
  - Number of Penetrations Tested
Firestop Systems

Firestopping Project - Process and Protocol

- Submittal Requirements
  - Product Data Sheets
  - MSDS Sheets
  - Tested Systems Details / Fire Resistance Rated Assembly (ERRA)
  - Engineering Judgment / Equivalent Fire Resistance Rated Assembly (EFERRA)
  - Contractor Qualifications
    - FM Approved
    - UL / ULc Qualified
    - FCIA Membership Certificate
    - Manufacturer recognition
Firestop Systems

Firestopping Project - Process and Protocol

- Submittals
- Coordination Conference
- Mock-Up Meeting
- Installation
  - Products, Systems, EJ/EFRRAs, Labeling
- Documentation
  - Systems, EJ/EFRRAs
- Inspection – Installer, Fire/Bldg. Dept, 3rd party
  - Destructive, Visual
Firestop Systems

Firestopping Project - Process and Protocol

- Firestop Project “Labeling”
  - Size and Type – Various
    - 2” x 3”, or other…
    - Paper, Plastic/paper composite, Steel, Ceramic
  - Attach to .. With?
    - Wall, Floor, or Penetration?
    - Adhesive, Staple, or both…
FCIA Firestopping Quality Process

Construction Industry Quality Issues
FCIA Firestopping Quality Process

🔹 “Where are the Certified Firestoppers?” Ken Hercenberg Assoc., Architects, Baltimore, MD….

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Aedan Gleeson, FCIA — Jeff Gould, FM ---
The Specifier, Letters to Editor”
FCIA Firestopping Quality Process

♦ Who’s Qualified & Understands Firestopping?
♦ Specialty Firestopping Contractor, FCIA Members!
♦ SYSTEMS Ratings Understanding
  • “F” Fire & “T” Temperature, “H” Hose
  • “L” Smoke
  • “W” Water
  • Insulation/Integrity
  • Movement Capability
  • DOCUMENTATION
FCIA Firestopping Quality Process

- **FM 4991** – Standard for the Approval of Firestop Contractors, Class 4991
- **UL Qualified Firestop Contractor Program**
  - Quality Protocol
  - Specified by Architect/Owner
  - Bought by Owner / GC
  - Contractors Quantifiably Qualified
  - Firestop Systems Installation & Maintenance
FCIA Firestopping Quality Process

“FCIA Members, FM 4991 & UL QFC
Zero Tolerance” Quality Control

– Independent Firestop Contractor Approval
  • Audit & Test Proven Contractor
  • Education, Training, Accountability
    = Reduced Risk – Life, Property, Business

– FM 4991 & UL Qualified Contractor Listing
  • FM & UL Guides
  • www.fcia.org
FCIA Firestopping Quality Process

*FM 4991 & UL QFC Requirements - Contractor Firms*

- 2 years in business (FM Only)
- **Employs** Designated Responsible Individual (DRI)
FCIA Firestopping Quality Process

**FM 4991 & UL QFC Requirements**

**FM 4991 & UL – DRI’s**
- Pass Rigorous Examination
  - FCIA Manual of Practice
  - Firestop Systems Selection & Protocol
  - FM 4991 Standard, UL QFC Program
- Retested every 3 years (FM Only)
- Continuing Education Unit Requirement – 6 per 3 yrs.
- One DRI per Approved Contractor Location
FCIA Firestopping Quality Process

*FM 4991 & UL QFC Requirements*
Initial **Firm** - Office Audit

- **Firestopping Firm’s Quality Manual**
  - Record keeping - Variance Procedures
  - Training & Education
  - Labeling
  - Material Controls
  - Systems installation “protocol”
  - Documentation
  - Project closeout

- **FM Approved, UL Qualified**
FCIA Firestopping Quality Process

**FM 4991 & UL QFC Requirements**
Initial *Firm* Jobsite Audit

- Verification of firestop systems installation
- Verify Quality Procedures
- Verify “communication”
  - Office to field, field to office
FCIA Firestopping Quality Process

*FM 4991 & UL QFC Requirements*

Annual FM / UL *Firm* Audit

- Continued satisfactory performance
  - Quality Manual
- Documented - Archived record keeping
- Employee Training Documentation
- Jobsite Visit
- DRI CEU Verification
FCIA Firestopping Quality Process

FM 4991 Approved & UL Qualified Contractors

• Professionalism – Managed DRI’s, staff, crews
  ▪ Quantifiably qualified firms
  ▪ Written Quality Control Process
  ▪ Expedites AHJ Inspection for Life Safety
  ▪ Process result = Effective Compartmentation
  ▪ UL Qualified Firestop Contractor Program
FCIA Firestopping Quality Process
Part III – Inspection
“Design, manufacture, marketing, service, testing all go on forever in a cycle…..”


- ASTM E814, UL 1479, S115 Systems,
- Installed by FCIA Member,
- FM 4991or UL QFC Contractor, Inspected
- ASTM E 2174,E 2393 Maintained by FCIA Member Contractor and Building Processes

“The Firestopping Quality Process”
FCIA Firestopping Quality Process

- ASTM E 2174 & ASTM E 2393

  “Standard Practice for On-Site Inspection of Installed Fire Stops”

- “Standard Inspection Procedure”

  - Fire Marshals & Code Officials
  - Inspection Firms
  - Architects
  - Other Qualified Firms
FCIA Firestopping Quality Process

- ASTM E 2174/ASTM E 2393 - “Inspector Firm Requirements”
  - Inspector NOT Related to Installing firm
    - Distributor, Manufacturer, Competitor, Supplier
  - Meet at least one criteria…..
    - 2 years experience (Construction, Field), education, and credentials acceptable to AHJ
    - Accredited by AHJ
    - Meet ASTM E699
  - Qualifications…FM or UL DRI Test
FCIA Firestopping Quality Process

♦ ASTM E 2174/ ASTM E 2393 – “Inspection Process”
  – Pre Construction Meeting
  • Review Documents – Identify Conflicts
  • Materials - ASTM E 814 or UL 1479-S115 Systems
    – “exactly as Identified on inspection documents”
FCIA Firestopping Quality Process

♦ ASTM E 2174/ ASTM E 2393 – “Inspection Process”

♦ Pre Construction Meeting
  – Mock Ups
    • Destructive Testing
    • Installation Measurements
  – Discuss Inspection Method

♦ Required for During/Post Insp. M
FCIA Firestopping Quality Process

♦ ASTM E 2174/ ASTM E 2393 – “Inspection Process”
♦ During Construction Inspection Method
  – Firestop Installation Start
  – Random witness 10%, each type of Firestop
    • No Less than one
FCIA Firestopping Quality Process

✦ ASTM E 2174/ ASTM E 2393 – “Inspection Process”

✦ Post Construction Method –
  – Destructive Testing
    • Minimum 2%, no less than 1, each type per 10,000 SF of floor area
    • If 10% variance per firestop type
      – Inspection stops
      – Installer inspects, repairs
      – Inspector reinspects
FCIA Firestopping Quality Process

- ASTM E 2174/ ASTM E 2393
  “Inspection Process”
- Inspection Forms
  - One for each type of firestop
  - Submit 1 day after inspection to Authorizing Agency
  - Numbered – Controlled
- Required – During/Post Construction Methods
FCIA Firestopping Quality Process

- Final Report – During/Post Inspection Method
  - Name, address, location – project, installer, inspector
  - Type and quantity of firestops inspected
  - Verification method
  - Percentage Deviation
  - Copies of all documents sent to Authorizing Agency
FCIA Firestopping Quality Process

- Why require ASTM E 2174 / ASTM E 2393
  - Quality Process Cycle
  - Verify Field Installations
  - “Service & Testing Cycle”….Demming
FCIA Firestopping Quality Process

Firestop Contractor Quality

A/E Specifications—07 84 00 (was 07270)MF95

– 07 84 10 – Through Penetration Firestop Systems
  • Pipes, cables, ducts, cable trays, MEP&C Systems
– 07 84 20 – Fire Resistive Joint Systems
  • Top of Wall
  • Fire Resistance Rated Joints
  • Perimeter Joints (Floor Slab edge/Exterior Wall)
– MF 04 – Multiple Sections
FCIA Firestopping Quality Process

- A/E Specifications – Systems Testing
  - “F” Ratings = Fire Resistance Rated Assy.
  - “T” Ratings = F & T??
  - “H” Ratings – Hose Stream
  - “L” Ratings = Fire & Smoke Resistance Rated Construction…non rated?
  - “W” Ratings – Floors; Functional when? Floor Loading Capabilities?
FCIA Firestopping Quality Process

♦ A/E Specifications –
♦ Firestopping Installation Quality Process
  – FCIA Member Specialty Firestop Contractors
    • FM 4991 Approved / UL Qualified Contractors
  – ASTM E 2174 & ASTM E 2393 Inspection
    • Qualifications?
  – Maintained by FCIA Member, FM 4991 / UL QFC Firms
    • Owner Documentation
    • Building Manager/Engineer Culture
      – Effective Compartmentation
FCIA Firestopping Quality Process
Part IV Maintenance
FCIA Firestopping Quality Process

- Effective Compartmentation Maintenance
  - Existing Buildings
    - Firestopping & Smoke Protection
    - Fire / Smoke Dampers
    - Fire / Smoke Doors
    - Fire / Smoke Walls & Floors
    - Fireproofing

- Required by Code …
FCIA Firestopping Quality Process

¤ Maintenance of Effective Compartmentation
    • “Maintain Effective Compartmentation & Structural Fire Protection”
  – Passed, ICC May 2004
  – International Fire Code
  – NBC – Maintenance
703.1 Maintenance. The required fire resistance rating of fire-resistance rated construction (including walls, fire stops, shaft enclosures, partitions, smoke barriers, floors, fire resistive coatings and sprayed fire resistant materials applied to structural members and fire resistive joint systems) shall be maintained. Such elements shall be properly repaired, restored or replaced when damaged, altered, breached or penetrated. Openings made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings, and hoes made for any reason shall be protected with approved methods capable of resisting the passage of smoke and fire. Openings through fire-resistance rated assemblies shall be protected by self closing or automatic-closing doors of approved construction meeting the fire protection requirements for the assembly.
FCIA Firestopping Quality Process

◆ "TOTAL FIRE PROTECTION
  – Effective Compartmentation - Fire Walls/Floors & Firestopping
  – Fire Dampers, Fire Glass
  – Detection & Alarm Systems
  – Sprinkler Suppression Systems
  – Building Personnel, Occupant and Firefighter Education
FCIA Firestopping Quality Process

Properly Designed Effective Compartmentation

- Tested and Listed Systems, FCIA Member Mfr’s.
- Properly Installed – FCIA Member, “FM 4991 Approved, UL Qualified Firestop Contractors”
- Properly Inspected - “ASTM E 2174 & ASTM E 2393 Inspection Process”
- Properly Maintained – FCIA Member, FM 4991 or UL Qualified Contractor
FCIA Firestopping Quality Process

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Firestop Systems

Tools and Equipment

- Caulk Guns
- Bulk Caulk Guns
- Bulk Loaders
- Follow Plates
- Spray Pumps
- Silicone Foam Pumps
- Tooling Devices
- Tested and Listed Systems
Firestop Systems

Tools and Equipment

- Caulk Guns
- Bulk Caulk Guns
- Tooling Devices
Firestop Systems

Tools and Equipment

♦ Bulk Loaders
♦ Follow Plates
♦ Tooling Devices
Firestop Systems

Tools and Equipment

- Spray Pumps
Firestop Systems

Tools and Equipment

- Silicone Foam Pumps
Firestop Systems

Tools and Equipment

- Tested and Listed Systems
Firestop Systems

Firestopping Safety

- Tools
- Ladders and Scaffolding
- Concealed Spaces
- “Climbing”
- Firestopping Material Handling
- NSC Stats - Work injuries cost Americans $146.6 billion in 2002 - $1,060 per worker.
Firestop Systems

Firestopping Safety

♦ Tool Safety Caution Points
  – Caulking Guns and Bulk Loaders
  – Tooling Spatulas
  – Spray Equipment –
    • Hoses – Frequent Inspections
    • Spray Tip Clogging = Exploding hose
    • Fuel indoors + Ignition Source = FIRE
  – Power Tools – Saws, Drivers, Caulk Guns
  – Eye Protection, Gloves, Respiration Equipment
  – Silicone Foam Pumps
Firestop Systems

Firestopping Safety

- Ladders and Scaffolding
  - Alignment 1:4 Ratio
  - Weight
  - Maintenance
Firestop Systems

Firestopping Safety

- Ladders and Scaffolding
Firestop Systems

- Firestopping Safety
  - “Climbing”
    - Access to penetrations / joints
    - OSHA Required Fall Protection
Firestop Systems

Firestopping Safety

♦ Electrical Protection
Firestop Systems

Firestopping Safety

- Concealed Spaces - OSHA
  - Respiration / Oxygen – SCBA Equipment
  - Ventilation
  - Chemicals - old stored materials
Firestop Systems

Firestopping Safety

- Working above ground
  - Fall Arrest Systems..follow OSHA Standards
    - Limit force – 1,800 lbs.
    - Complete stop – 3.5’
    - Withstand Impact 2x weight, in 6’
  - Rescue
  - Do not attach to hoists, guardrails
Firestop Systems

Firestopping Safety

♦ Firestopping Materials
  – Sealant Chemicals
    • Pre 1995 = Toluene, MEK Base
    • Cleaning Materials – Toluene, etc.
    • Silicone Systems
    • Latex Systems
  – MSDS Sheets
Firestop Systems

Firestopping Safety

- Firestopping Materials - Backing
  - Mineral Wool Fibers
  - Ceramic Fibers
  - Backer Rods
- Respirators as required
Firestop Systems

Firestopping Safety

- Firestopping Materials - Backing
  - Composite Sheets
  - Wrap Strips and Collars
  - Collar Kits

- Sharp Edges
Firestop Systems

Maintenance Guidelines

- Identify Fire and Smoke Resistance Rated Assemblies
Firestop Systems

Maintenance Guidelines

- Identify Systems
  - Labels
    - Paper
    - Plastic
  - Tags
    - Metal
    - Ceramic
Firestop Systems

Maintenance Guidelines

- Materials – Pre 1992 may be solvent
- Packing – Density?
- Shrinkage?
- Annular Spaces?
- Pipe Type and Size? Insulation? Joint? Gap?
- Number of penetrating items in opening?
- Cable type and size?
- Hourly Rating Required?
Firestop Systems

Estimating

- Specifications
- Plans
- Takeoff
- Calculating Quantities
- Estimates
- Proposals
Firestop Systems

Legal Points to Know

- Installer Liability
  - “Negligence”

- Contractor Liability
  - “Negligence” - … “Ever been to a Firestop Class?”
  - “Having Knowledge”
The Firestopping Process

Proper ‘DIIM’ Effective Compartmentation Means Reliable Systems…

♦ *Designed* - A/E, Firestop Consultant
  – Tested and Listed Systems, FCIA Member Mfr’s.

♦ Properly *Installed*
  – FCIA Member, “FM 4991, or UL QFC Contractors”

♦ Properly *Inspected*
  – ASTM E 2174 & ASTM E 2393 Inspection

♦ Properly *Maintained* –
  – FCIA Member
Firestop Systems

Firestop Systems

♦ Questions?
Firestop Systems

General Firestopping Education

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